Jellyfish Gene Lights Up *E. coli*

A jellyfish gene is helping researchers discover the secrets of how a food-poisoning bacterium spreads. Microbiologist Marian R. Wachtel with the Agricultural Research Service in California has inserted the gene into laboratory strains of the foodborne bacterium *Escherichia coli* O157:H7.

In nature, the gene cues a jellyfish to make a bright-green fluorescent protein. In Wachtel's laboratory, the fluorescence acts as a readily detectable marker that makes it easier for her to spy on *E. coli* microbes as they attempt to colonize the leaves of fresh lettuce.

If consumed, *E. coli* O157:H7 can cause bloody diarrhea and in some instances can lead to acute kidney failure, requiring patients to undergo dialysis. The microbe is unusual in that most other bacteria in the same family are harmless to humans.

Wachtel says her fluorescence-based assay enables researchers to quickly detect the presence and quantity of the genetically engineered bacterium in lettuce. This powerful new technique should help her and other food safety scientists test the effectiveness of new tactics designed to keep the pathogen out of food.

Viewed with ultraviolet light in the laboratory, the microbe fluoresces a bright green. "We can detect the fluorescent, genetically engineered microbe not only as it attaches to the surface of lettuce leaves," reports Wachtel, "but also if it moves deep within lettuce tissue." She is with the Food Safety and Health Research Unit at ARS' Western Regional Research Center at Albany, California.

Outbreaks of *E. coli* O157:H7 linked to contaminated lettuce are infrequent, occurring only about once a year in the past 9 years. But ARS scientists like Wachtel want to help growers, processors, and consumers ensure that the popular leafy vegetable remains safe to eat. Wachtel says that eating fresh lettuce, properly washed, "should pose no significant health hazard."

The idea of moving the fluorescence gene, borrowed from *Aequorea victoria* jellyfish, into other organisms isn't new. But Wachtel is among the first to make a detailed study of plant tissue with fluorescent *E. coli* O157:H7 added.

So far, she's used the assay in laboratory experiments with romaine, green leaf, and iceberg lettuces that she has artificially infected with the genetically engineered *E. coli*.—By **Marcia Wood,** ARS.

This research is part of Food Safety, an ARS National Program (#108) described on the World Wide Web at http://www.nps.ars.usda.gov/programs/appvs.htm.

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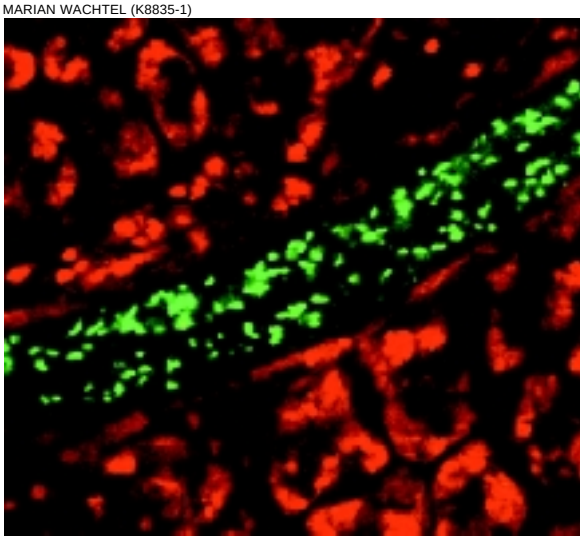

A confocal scanning laser micrograph of fluorescent green *E. coli* gaining access to the xylem of cut leaf lettuce. (Magnification about 1,000x.)